**MULTIMEDIA** **UNIVERSITY**

# MULTIMEDIA UNIVERSITY

# FINAL EXAMINATION

TRIMESTER 2, 2019/2020

## PMT0201 – MATHEMATICS II

(All sections/ Groups)

2 MARCH 2020
2.30 p.m. – 4.30 p.m.
(2 Hours)

| Question | Marks |
|----------|-------|
| 1 | /10 |
| 2 | /10 |
| 3 | /10 |
| 4 | /10 |
| 5 | /10 |
| Total | /50 |

**INSTRUCTIONS TO STUDENTS**

1. This question paper consists of **THIRTEEN** printed pages excluding cover page.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the **QUESTION BOOKLET**. All necessary working steps **MUST** be shown to obtain maximum marks.

**Question 1**

a) Suppose an angle $\theta$ is in Quadrant III.

   i)  Write $\sec\theta$ in terms of $\sin\theta$.                         (1.5 marks)

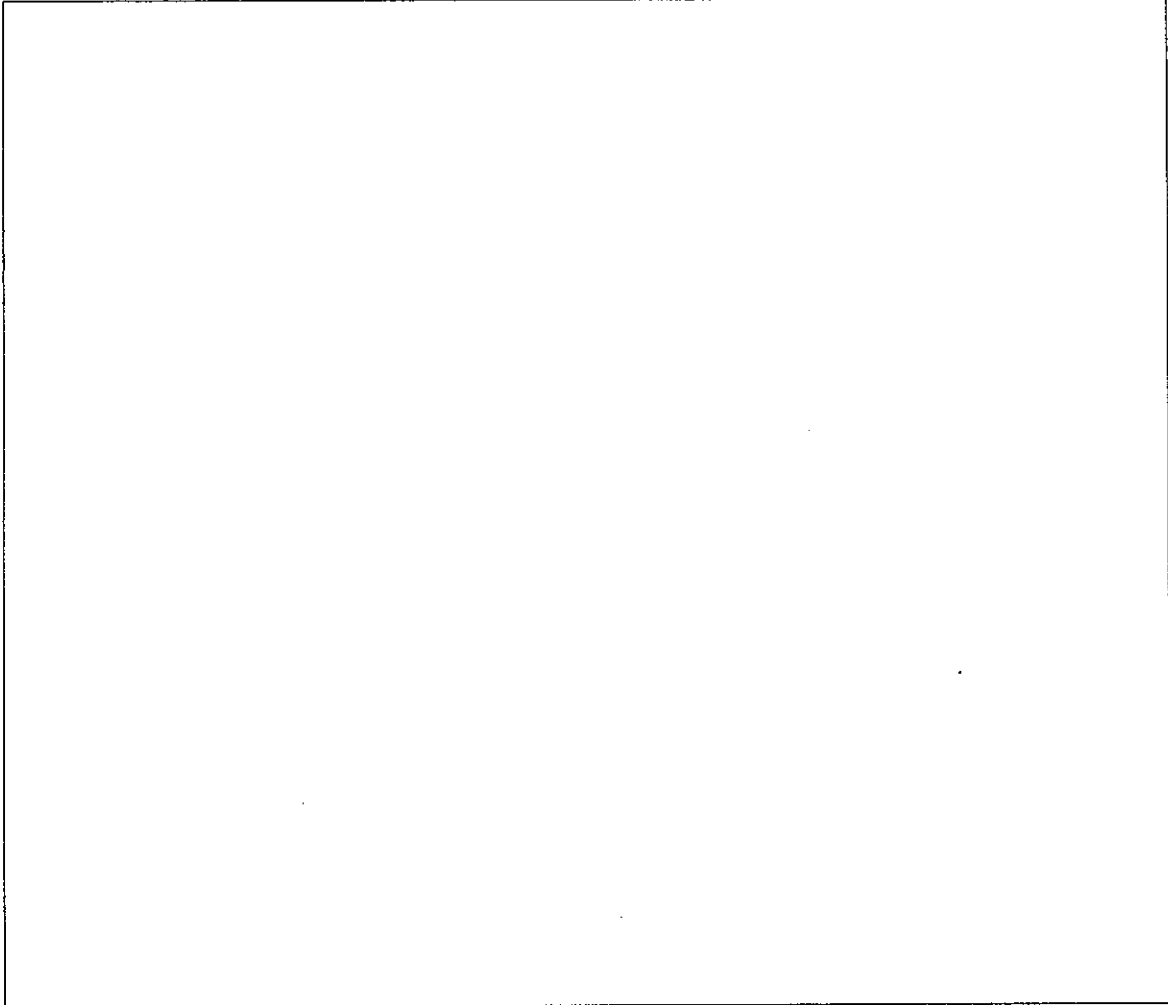ii) Based on part 1(ai), given $\sin\theta = -\dfrac{2}{3}$, find the exact value of $\sec\theta$.    (1 mark)

b) The triangle $ABC$ has lengths $AB = 4cm$ and $BC = \sqrt{18}cm$. Given the area of the $ABC$ triangle is $\sqrt{54}cm^2$. Find all the possible lengths of $AC$.          (3.5 marks)

c) Given that $f(x) = -2\sin\left(\dfrac{x}{2} - \dfrac{\pi}{4}\right) + 1$.

    i)   Determine the amplitude, period, phase shift and vertical shift of $f(x)$.   (2 marks)

ii) Sketch the function $f(x)$ for one complete period.         (2 marks)

**Question 2**

a) Without calculator, find the exact value of $\tan\left(2\cos ec^{-1}\left(-\frac{5}{3}\right)\right)$.                    (3 marks)

b) Solve the equation of $\sin 2\theta \cos 3\theta - \cos 2\theta \sin 3\theta = \dfrac{\sqrt{3}}{2}$ in $0^{\circ} < \theta < 360^{\circ}$.      (2 marks)

c) Given $w = \dfrac{5}{\sqrt{2}}\left(\cos 300^{\circ} + i \sin 300^{\circ}\right)$ and $z = -1 - i$.

    i) Find the polar form of $z$ with $0^{\circ} < \theta < 360^{\circ}$.      (2.5 marks)

ii) Find $wz$ and express your answer in the polar form with $0° < \theta < 360°$.   (1.5 marks)

d) Show that $\dfrac{\cos x}{\cot x} = \sin x$.                           (1 mark)

## Question 3

a) Find the following limits.

   i)  $\lim_{x \to 1} \dfrac{\sqrt{x} - 1}{x - 1}$ (2 marks)

   ii) $\lim_{x \to 0} \dfrac{x}{\tan x}$ (2.5 marks)

iii) $\lim\limits_{x \to \infty} \dfrac{-3x^4 + 4x^2 + 5}{x^4 - 2x^3 + 3x}$                                    (2.5 marks)

b)

Suppose that $f(x) = \begin{cases} 15 + a - x^3 & \text{if } x < 3 \\ -3 & \text{if } x = 3 \\ \dfrac{x - a}{2} & \text{if } x > 3 \end{cases}$

Given $f(x)$ is continuous at $x = 3$. Find the value of $a$.                                    (3 marks)

## Question 4

a) Find the derivatives of $y = e^{5x} \sin(2x-1)$ using product rule. Simplify your answer.

(2.5 marks)

b) Find the derivatives of $y = \left[\ln(2x)\right]^5$ using chain rule. Simplify your answer.

(2.5 marks)

c) A ball is thrown upwards from the ground with an initial velocity of 28 ms$^{-1}$. Its position is given by $s(t) = 28t - 4t^2$.

   i)   What is the maximum height that can be reached by the ball?          (2 marks)

ii) What is the velocity of the ball when it is 40m above the ground on its way up?

                                                           (3 marks)

## Question 5

ai) Find the indefinite integral $\int \left(3x^2\right) \left(x^3 - 2\right)^2 \, dx$ using integration by substitution.

(2.5 marks)

ii) Based on part (ai), evaluate the definite integral of $\int_0^1 \left(3x^2\right) \left(x^3 - 2\right)^2 dx$.　　　(1.5 marks)

b) Find the indefinite integral $\int \dfrac{3x+1}{x^2-1}\,dx$ using partial fractions.        (3 marks)

c) The curve $y = x^3 - x^2 - 5x + 2$ intersects the line $y = 2 + x$ at points $(-2,0)$, $(0,2)$ and $(3,5)$. Find the area of the shaded region in **Figure 1**.       (3 marks)
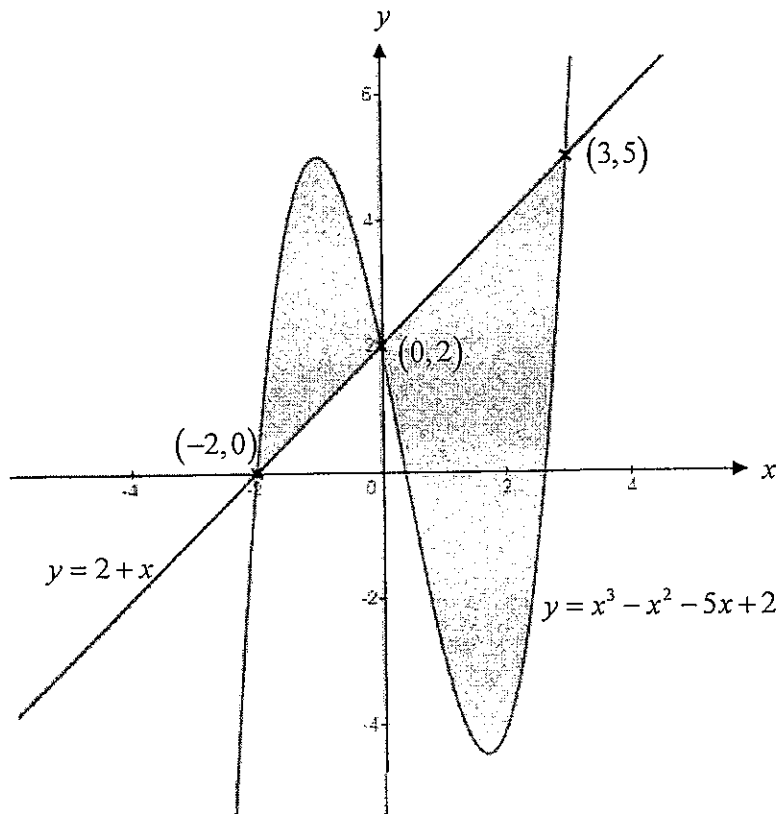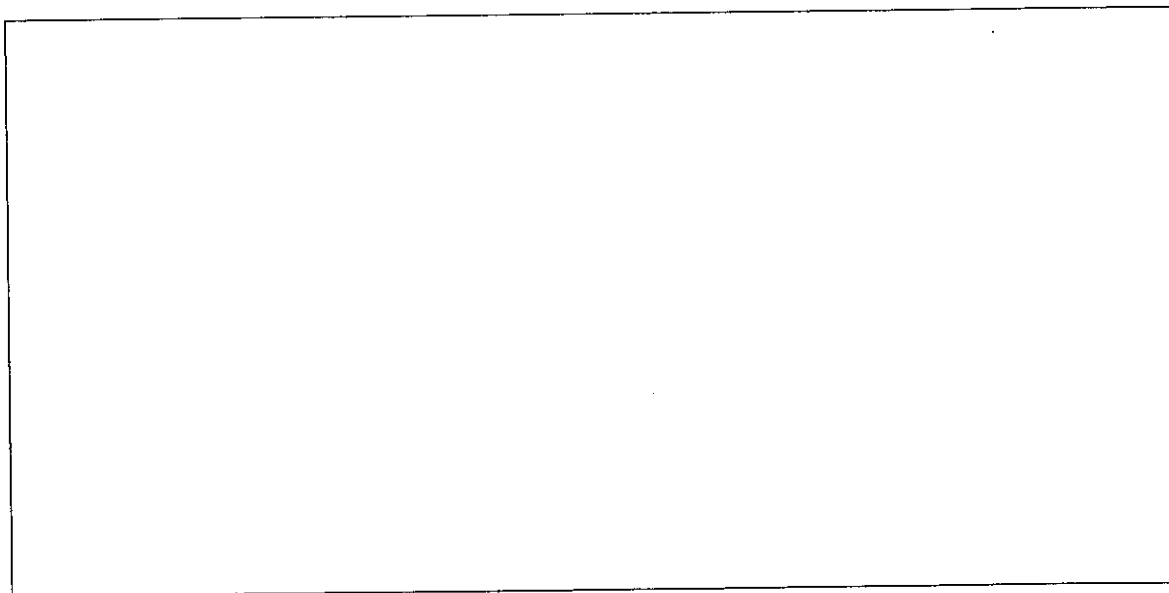


**Figure 1**

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